

Assignment 10

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1 Task 1

Generating five images passing five noise vectors/matrices drawn from a normal distribution with mean 5 and variance through the Decoder of your normal Autoencoder.

1.1 Answer:

In task one, we use the MNIST dataset to train our autoencoder. And we trained it for 20 epochs. Then we generate 5 random vectors in a normal distribution with a mean of 5.

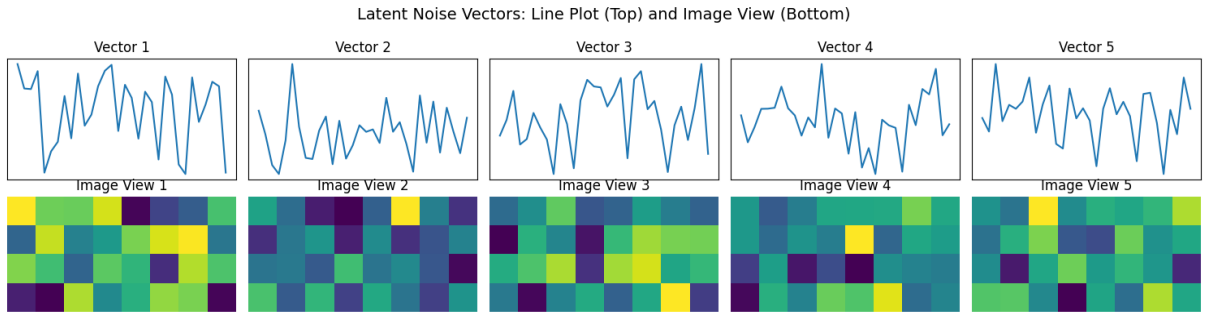


Figure 1: vectors and their xy plane plotting

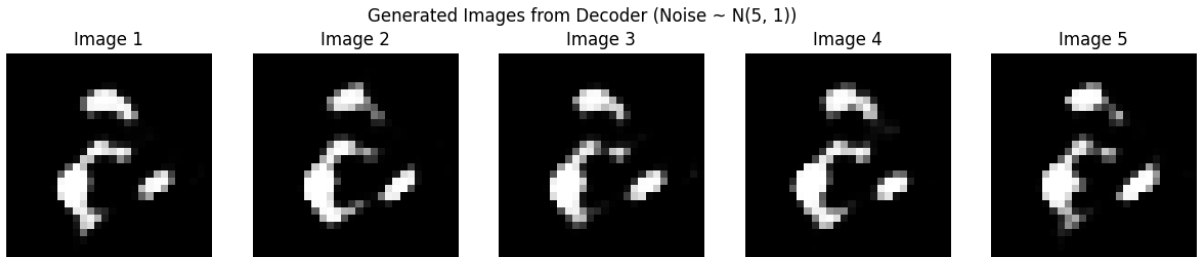


Figure 2: The constructed image from random vectors

2 Task 2

Generating five images passing five noise vectors/matrices drawn from a normal distribution with mean 5 and variance through the Decoder of your Denoising Autoencoder.

2.1 Answer:

In task two, we use the MNIST dataset to train our Denoising autoencoder. And we trained it for 20 epochs. Then we generate 5 random vectors in a normal distribution with a mean of 5 and pass them through this denoising autoencoder and construct an image from this.

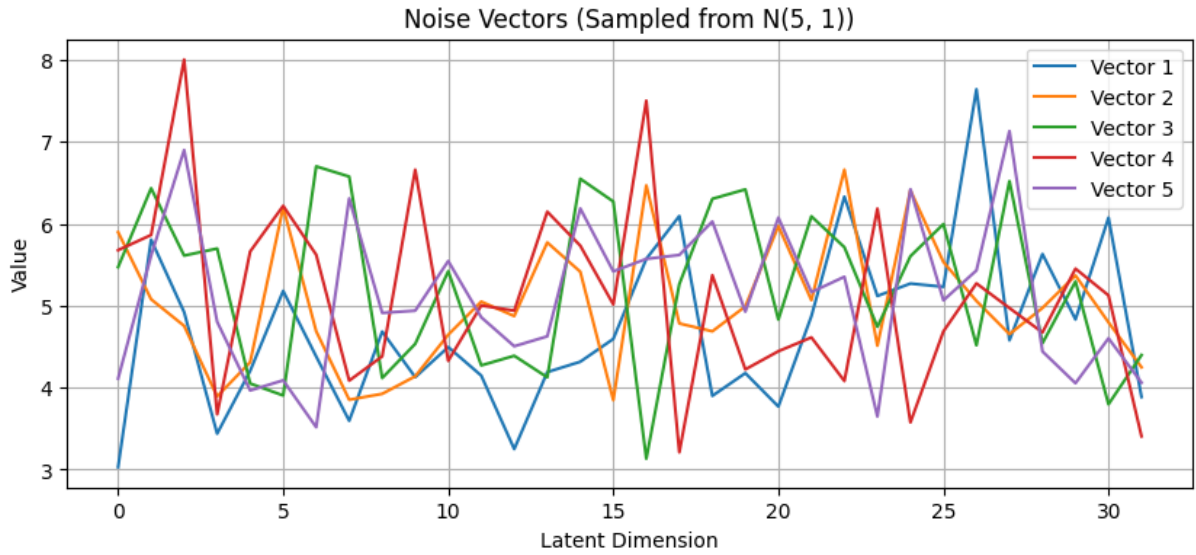


Figure 3: The random vectors in the xy plane where, $x = \text{value}$ and $y = \text{latent dimension}$

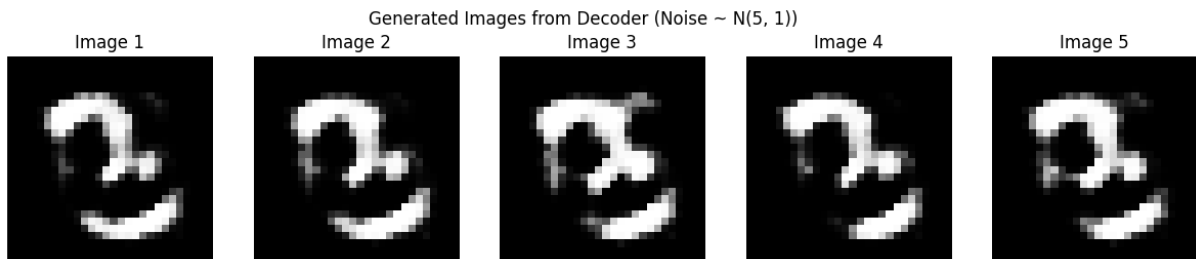


Figure 4: The constructed image from random vectors by denoising autoencoder

3 Task 3

Training and evaluating a Variational Autoencoder

3.1 Answer

We trained a Variational Autoencoder (VAE) on the MNIST dataset for 15 epochs. Throughout training, the loss steadily decreased from 20,945.83 to 13,382.61, indicating effective learning. After training, the model achieved an MSE of 0.0136, MAE of 0.0402, and an R^2 score of 0.1437, reflecting moderate reconstruction performance.

- Mean Squared Error (MSE): 0.0136
- Mean Absolute Error (MAE): 0.0402
- R^2 Score: 0.1437

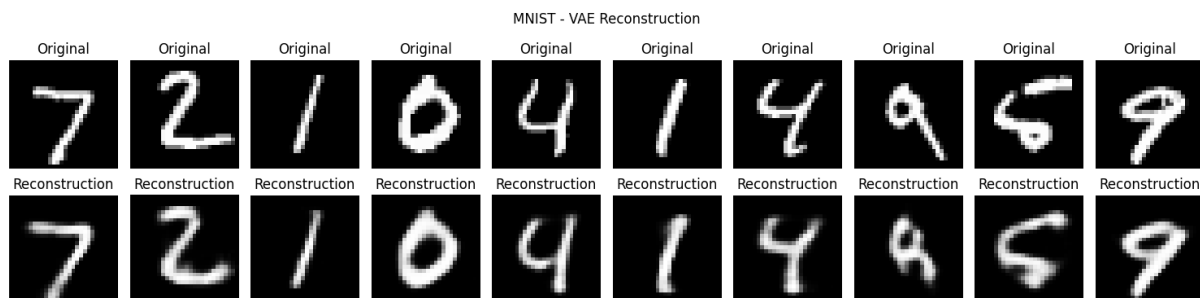


Figure 5: The constructed image from vectors and original images

4 Task 4

Generating five images passing five noise vectors/matrices drawn from a normal distribution with mean 5 and variance through the Decoder of your Variational Autoencoder.

4.1 Answer

We generated five images by passing noise vectors sampled from a normal distribution with a mean of 5 and a variance of 1 through the decoder of our trained Variational Autoencoder. This demonstrates the model's ability to generate plausible digit-like images from latent space samples.

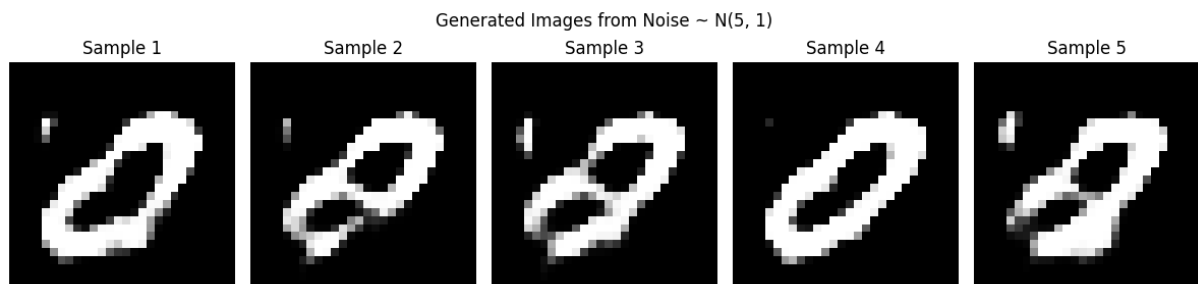


Figure 6: The reconstructed image from random vectors by variational autoencoder

5 Source Code link

The full Source code is available on GitHub:
<https://github.com/Arif11866/Deep-Learning-AI/tree/main>